

**REMARKS**

The following remarks are made in response to the Final Office Action mailed November 30, 2007. Claims 1, 3-9, 11-25, and 27-31 were rejected. With this Response, claims 1, 8, 16, and 25 have been amended, and claims 3, 11, and 27 have been cancelled. Claims 1, 4-9, 12-25, and 28-31 remain pending in the application and are presented for reconsideration and allowance.

**Claim Rejections under 35 U.S.C. § 112**

The Examiner rejected claims 1, 8, 16, and 25 under 35 U.S.C. § 112 as failing to comply with the enablement requirement.

Applicant submits that amended independent claims 1, 8, 16, and 25 comply with the enablement requirement. The ions listed in the amended claims are listed in the specification for example in paragraph [0031]. The specification also lists additional unclaimed ions, but the unclaimed ions are not required for enablement. The unclaimed ions are merely additional options. The Examiner states that the specification does not contain any description excluding the use of P and As and cites paragraph [0029] as describing a transistor cell 40 having source 46 and drain 50 doped with arsenic, phosphorous, boron, or other suitable material. (Final Office Action, page 3). The ions listed in the amended claims are being implanted into a high-k dielectric layer, not source and drain regions. Arsenic, phosphorous, and boron are merely options and are not required for enablement.

In view of above, Applicant submits that the above rejection of independent claims 1, 8, 16, and 25 under 35 U.S.C. § 112 as failing to comply with the enablement requirement be withdrawn. Allowance of claims 1, 8, 16, and 25 is respectfully requested.

**Claim Rejections under 35 U.S.C. § 103**

The Examiner rejected claims 1, 4-9, 12, 25, 28, and 29 under 35 U.S.C. § 103(a) as being unpatentable over Collins, U.S. Patent No. 6,518,195 ("Collins"), in view of Jeon, U.S. Patent No. 6,790,755 ("Jeon"). The Examiner rejected claims 3, 11, 13-24, and 27 under 35

**Amendment and Response Under 37 C.F.R. 1.116**

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Title: PLASMA ION IMPLANTATION SYSTEM

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U.S.C. § 103(a) as being unpatentable over Collins in view of Jeon and further in view of Yamada, U.S. Patent Publication No. 2001/0054746 ("Yamada").

Independent claim 1 has been amended to include subject matter from dependent claim 3, and claim 3 has been cancelled. Independent claim 8 has been amended to include subject matter from dependent claim 11, and claim 11 has been cancelled. Independent claim 25 has been amended to include subject matter from dependent claim 27, and claim 27 has been cancelled. Therefore, the rejection of independent claims 1, 8, and 25 will be addressed in response to the Examiner's rejection of claims 3, 11, and 27.

Applicant submits that Collins, Jeon, and Yamada, either alone, or in combination, fail to teach or suggest the limitations recited by amended independent claim 1 including **a plasma generator generating ions comprising one of F, Si, O, Hf, Zr, Ti, Ta, Y, V, Sc, Ba, Sr, Ru, Al, Ga, In, Ge, C, and Sb in the vacuum chamber.**

**Collins** discloses a domed plasma reactor chamber that uses an antenna driven by RF energy that is inductively coupled inside the reactor dome. The antenna generates a high density, low energy plasma inside the chamber for etching metals, dielectrics, and semiconductor materials. (Abstract). Collins discloses specific process aspects including etching oxide; "light" etching of silicon oxide and polysilicon; high rate isotropic and anisotropic oxide etching; etching polysilicon conductors; photoresist stripping; anisotropic etching of single crystal silicon; anisotropic photoresist etching; low pressure plasma deposition of nitride and oxynitride; high pressure isotropic conformal deposition of oxide, oxynitride, and nitride; etching metals; and sputter facet deposition, locally and globally, and with planarization. (Col. 6, lines 5-17).

**Jeon** discloses a layered dielectric structure comprising an alternating pattern of at least two sub-layers of a first dielectric material which is a high-K dielectric material and at least one layer of a second dielectric material which is a standard-K dielectric material, wherein at least one of the one or more second dielectric material sub-layers contain nitrogen implanted therein using a nitridation step. (Abstract).

**Yamada** discloses a bipolar transistor. Yamada discloses that an n-type impurity such as phosphorus (P) or arsenic (As) is ion-implanted through an opening in the mask 200 to locally change the SOI silicon layer 3 into the n<sup>-</sup>-type collector region with a uniform concentration.

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(Para. 0138). Yamada also discloses that for making the p<sup>+</sup>-type external base region 9, a method can be used, in which boron (B) is ion-implanted into polysilicon. (Para. 0129).

The Examiner admits that Collins fails to disclose implanting ions into a *high-k dielectric layer*. (Final Office Action, page 5). Yamada also fails to disclose implanting ions into a *high-k dielectric layer*. Yamada merely discloses a method for forming a BJT. In addition, neither Collins, Jeon, nor Yamada disclose generating ions comprising one of *F, Si, O, Hf, Zr, Ti, Ta, Y, V, Sc, Ba, Sr, Ru, Al, Ga, In, Ge, C, and Sb* or implanting the ions into a *high-k dielectric layer*. Therefore, it would not have been obvious to one of ordinary skill in the art to combine the plasma reactor disclosed by Collins, the nitridation step disclosed by Jeon, and the bipolar transistor disclosed by Yamada to implant a high-k dielectric layer as recited by independent claim 1.

In view of the above, Applicant submits that the above rejection of independent claim 1 under 35 U.S.C. § 103(a) should be withdrawn. Dependent claims 4-7 further define patentably distinct independent claim 1. Accordingly, Applicant believes that these dependent claims are also allowable over the cited references. Allowance of claims 1 and 4-7 is respectfully requested.

For similar reasons as discussed above with reference to independent claim 1, Applicant submits that Collins, Jeon, and Yamada, either alone, or in combination, also fail to teach or suggest the limitations recited by amended independent claim 8 including **a plasma generator generating ions comprising one of F, Si, O, Hf, Zr, Ti, Ta, Y, V, Sc, Ba, Sr, Ru, Al, Ga, In, Ge, C, and Sb from the gas.**

In view of the above, Applicant submits that the above rejection of independent claim 8 under 35 U.S.C. § 103(a) should be withdrawn. Dependent claims 9 and 12-15 further define patentably distinct independent claim 8. Accordingly, Applicant believes that these dependent claims are also allowable over the cited references. Allowance of claims 8, 9, and 12-15 is respectfully requested.

For similar reasons as discussed above with reference to independent claim 1, Applicant submits that Collins, Jeon, and Yamada, either alone, or in combination, also fail to teach or suggest the limitations recited by amended independent claim 16 including **a plasma generator**

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**generating ions from the gas, the ions comprising one of F, Si, O, Hf, Zr, Ti, Ta, Y, V, Sc, Ba, Sr, Ru, Al, Ga, In, Ge, C, and Sb.**

In view of the above, Applicant submits that the above rejection of independent claim 16 under 35 U.S.C. § 103(a) should be withdrawn. Dependent claims 17-24 further define patentably distinct independent claim 16. Accordingly, Applicant believes that these dependent claims are also allowable over the cited references. Allowance of claims 16-24 is respectfully requested.

For similar reasons as discussed above with reference to independent claim 1, Applicant submits that Collins, Jeon, and Yamada, either alone, or in combination, also fail to teach or suggest the limitations recited by amended independent claim 25 including **generating a plasma comprising ions comprising one of F, Si, O, Hf, Zr, Ti, Ta, Y, V, Sc, Ba, Sr, Ru, Al, Ga, In, Ge, C, and Sb in the vacuum chamber from the gas.**

In view of the above, Applicant submits that the above rejection of independent claim 25 under 35 U.S.C. § 103(a) should be withdrawn. Dependent claims 28 and 29 further define patentably distinct independent claim 25. Accordingly, Applicant believes that these dependent claims are also allowable over the cited references. Allowance of claims 25, 28, and 29 is respectfully requested.

The Examiner rejected claims 30 and 31 under 35 U.S.C. § 103(a) as being unpatentable over Collins and Jeon in view of Wu, U.S. Patent No. 6,248,662 ("Wu").

Dependent claims 30 and 31 further define patentably distinct independent claim 25. Accordingly, Applicant believes that these dependent claims are also allowable over the cited references. Allowance of claims 30 and 31 is respectfully requested.

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**CONCLUSION**

In view of the above, Applicant respectfully submits that pending claims 1, 4-9, 12-25, and 28-31 are in form for allowance and are not taught or suggested by the cited references. Therefore, reconsideration and withdrawal of the rejections and allowance of claims 1, 4-9, 12-25, and 28-31 is respectfully requested.

No fees are required under 37 C.F.R. 1.16. However, if such fees are required, the Patent Office is hereby authorized to charge Deposit Account No. 50-0471.

The Examiner is invited to contact the Applicant's representative at the below-listed telephone numbers to facilitate prosecution of this application.

Any inquiry regarding this Amendment and Response should be directed to Mark A. Peterson at Telephone No. (612) 573-0120, Facsimile No. (612) 573-2005. In addition, all correspondence should continue to be directed to the following address:

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Respectfully submitted,

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